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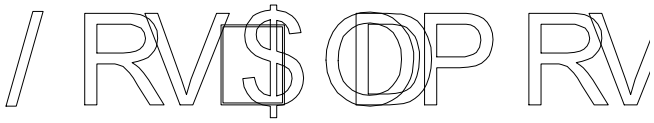

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TRANSIMS TRAVELOGUE

November 1999

TRANSIMS TRAVELOGUE describes current activities within the TRANSIMS project.

WHAT IS TRANSIMS?

The TRansportation ANalysis and SIMulation System (TRANSIMS) is one part of the multi-track Travel Model Improvement Program sponsored by the U.S. Department of Transportation, the Environmental Protection Agency, and the Department of Energy. Los Alamos National Laboratory is leading this major effort to develop new, integrated transportation and air quality forecasting procedures necessary to satisfy the Intermodal Surface Transportation Efficiency Act and the Clean Air Act and its amendments.

TRANSIMS is a set of integrated analytical and simulation models and supporting databases. The TRANSIMS methods deal with individual behavioral units and proceed through several steps to estimate travel. TRANSIMS predicts trips for individual households, residents and vehicles rather than for zonal aggregations of households. TRANSIMS also predicts the movement of individual freight loads. A regional microsimulation executes the generated trips on the transportation network, modeling the individual vehicle interactions and predicting the transportation system performance. Motor vehicle emissions are estimated using traffic information produced by TRANSIMS.

THE PORTLAND TRANSIMS STUDIES

Los Alamos is designing the Portland studies to refine and demonstrate the core TRANSIMS technologies and to investigate the effects of the TRANSIMS input data on the output. The study preparations and execution will prepare TRANSIMS-LANL for the TRANSIMS-DOT commercialization process and deployment of the TRANSIMS technologies to metropolitan planning organizations (MPOs).

One goal of the Portland TRANSIMS studies is to complete and demonstrate the basic TRANSIMS technology. A second is to develop methods and techniques that ease the TRANSIMS input data requirements for both forecasts and base year studies. Both efforts are critical to the successful deployment of the TRANSIMS technology, in which MPOs will exercise the methodologies in a forecast setting such as a regional transportation plan on a 15 to 20 year horizon.

The base TRANSIMS technology has the capability to model and simulate the activities and movements of a synthetic representation of every individual in a metropolitan area. This base set of technologies includes modules to develop a population and an activity list, route travelers between activities, and simulate their second-by-second movements on the transportation infrastructure. Feedback methods for stabilizing the simulation and modeling some transportation characteristics are part of the basic TRANSIMS framework. Some base technology characteristics are: multi-modal and intermodal travel, shared rides, high-occupancy-vehicle (HOV) lane usage, populations aligned in age with the study year, generic models of intelligent transportation system technologies, and the capability to represent itinerant travelers and freight as background traffic using given trip tables. Post processing the microsimulation output data allows for estimates of vehicle emissions and accident probabilities, equity analysis or network reliability studies as demonstrated in the Dallas study, “validation” of traffic counts by comparisons with existing data or models, and estimates of traditional transportation statistics such as VMT (vehicle miles traveled).

During the next year, Los Alamos will complete a base year Portland “validation” study for the years 1996-1997. Portland Metro is completing a transportation network and a set of land use data that reflect these years. The Portland study will demonstrate all modules of TRANSIMS including feedback. It will attempt to “duplicate” traffic conditions in Portland for a typical day in 1996. Featured will be multi-modal and intermodal trips (walk, auto, bus and light rail), actuated signals, shared rides, and feedback to stabilize travelers’ activity, mode and route choices. Vehicle emissions and accident probabilities will be estimated for the base year. Because HOV lanes or Intelligent Transportation System (ITS) technologies were not present in Portland in 1996, microsimulation of HOV lanes and feedback to model ITS technologies will be implemented in a second study.

The complete plan for HOV and ITS studies will be developed over the next year. A modified base network will be used in this study. It will include technologies for inter- and intra-household shared rides and a methodology in the microsimulation for

multiple occupancy vehicles to use HOV lanes. ITS technologies to be developed at a minimum will include automated tolls and ramp metering.

STUDY FEATURES

This base-year study will be the first time that the entire system, including the environmental module, is exercised on a real problem. Reports will describe detector technologies to drive actuated signals, iteration schemes for rapid stabilization of the system, methodologies to align the populations, methodologies for actuated signals, the characteristics of multi-modal and intermodal travel, and the realism of the emissions estimates. Some details on the specific technologies to be developed in this study are:

1. A methodology will age the baseline synthetic population from 1990 to 1996-1997 using projected summary demographics commonly available in planning organizations.
2. We will feed information from the microsimulation to the intermodal route planner to adjust the travelers' travel plans (mode choice, route plans, and their associated travel times) to match their actual executed travel more closely. We also will use feedback to refine their activity times and locations.
3. The three main TRANSIMS modules include methods to handle both multi-modal and intermodal travel. The TRANSIMS framework permits modeling mode choice in the activity list as in existing transportation models, in the router by trying all possible modes and using a rational choice model to decide the best mode, or by feedback with a rational choice model to select travelers for mode reassignment. We will investigate combinations of these three to determine realistic mode choices quickly.
4. We are developing a generic detector technology to control actuated signals. At a minimum this detector will measure flows, densities, speeds, counts and their variability and will allow noise to be included in any measurement. By changing the detector parameters, it will mimic any existing or future detector characteristics. This detector model is a precursor to the development of ITS technology methods.
5. We will add actuated signals as a feature to this study. If successful, the generic signals research discussed in the next section may encompass representations of such signal types.
6. We will develop some form of shared rides for each module. For the base-year study it may only be possible to consider intra-household shared rides. We will include inter-household shared rides in the HOV/ITS study.
7. We are developing methods to generate trips from generic time-of-day-dependent trip tables to produce background traffic that represents itinerant travelers and freight.
8. At a minimum we will complete the following output analysis of the base run. (1) We will estimate and display all forms of mobile emissions including those from both light- and heavy-duty vehicles and those caused by cold starts. (2) We will estimate and display the probability of accidents by transportation link and time of day. (3) We will collect, display and compare validation data with Portland counts or other model results.

GENERIC REPRESENTATIONS

Like existing models, TRANSIMS in a forecast setting requires data that reflects the future land-use, population demographics, and transportation infrastructure. With this information, the synthetic population is aged to match the projected population, the land-use is used to reassign activity locations and times, and the future transportation infrastructure is converted to TRANSIMS transportation network data. A TRANSIMS analysis with this data constitutes a TRANSIMS "forecast." TRANSIMS executions of such forecasts differ little from base-year applications or alternatives studies in which network detail may be reasonably well known. However, for a future-year network, the data would have to be estimated. Currently, a comprehensive model of a metropolitan region would include a network that represents all streets along with the allowed movements between links on the network. It would have signals and signal timings that yield realistic traffic flows. It would have realistic transit schedules. The input preparation of such specific data for an approximated future network would be time and data intensive while the output sensitivities to the input data uncertainties are unknown.

As stated previously, a second goal of the Portland TRANSIMS studies is to develop methods and techniques that diminish the TRANSIMS input data requirements and thereby make both forecasts and base-year studies with the technology much easier. In this series of studies, we will develop methods and techniques for generic representations in the TRANSIMS network rather than the current data intensive representations that try to replicate the operational features exactly. Generic representations will be investigated for local streets, signalized intersections and transit schedules.

The work to create a network is fairly extensive, particularly if each local street is represented. In addition, this detailed representation increases the processing time for each TRANSIMS module. Los Alamos will lead a research effort with assistance from Portland Metro to determine the minimum representation necessary to simulate urban travel adequately. As this local structure also accounts for land use and activity data, the proper representation is important. The effect of local streets, both their layout and their relationship to the surrounding major roadways, on the TRANSIMS output (including the emissions estimates) needs to be understood. This is important for forecast years where alternative street layouts may be placed on green fields, but also is important for the simulation of a base year where simple local street representations could reduce data collection and execution times. This research may allow for generic local street representations across green fields. In many cases local streets may be represented simplistically, parametrically, or not at all.

Traffic signal information for a network is time consuming to collect. In addition to developing a methodology for missing signal plans for the base year, a methodology is needed for both the placement and the plans for the forecast years. To solve this problem, either a generic methodology for the creation of the input network is needed or a generic representation of traffic behavior at major intersections is needed for the microsimulation. Portland Metro is taking the lead for characterizing the signal locations and timings. They will consider a rule-based approach to decide where to place signals. Possibilities include all arterial-arterial, arterial-collector and collector-collector intersections. Some local-collector and local-arterial intersections also may be considered.

Los Alamos will concentrate on the signal characterization in TRANSIMS and the effects of signal timings and placements on TRANSIMS output, in particular the emissions estimates. We currently are researching parameterized detectors and developing a probabilistic signal timing scheme that will allow for generic signal types. With this parameterization, traffic behavior (in particular that leading to emissions estimates) in the intersections can be calibrated. These parameterized intersections may mimic all signal types: pre-timed, actuated, adaptive, etc.

Transit itineraries are needed for the forecast year. The current itineraries for the base study are from the Portland Tri-Met scheduling process (run-cutting and scheduling). This approach probably is not feasible for a future hypothetical system that would contain transit stops in what are currently green fields. Working together, Portland Metro and Los Alamos will develop a simpler approach.

TRANSIMS COMMERCIALIZATION

On June 28-30, 1999, Los Alamos hosted the TRANSIMS Opportunity Forum in Santa Fe, New Mexico. Approximately 50 attendees not directly associated with the TRANSIMS project learned about the TRANSIMS technologies and our plans to commercialize them. Neil Pedersen, Michael Morris, Keith Lawton, Tom Kane, Keith Killough, Annette Liebe, Robert Jones, John Simon, and Chris Barrett presented transportation planning market information that reflected an excellent understanding of the TRANSIMS technology, was extremely supportive of the need for TRANSIMS, and was very helpful to the potential bidders for the TRANSIMS commercialization process. During sessions set aside for interactions with the TRANSIMS team, team members answered questions about prepared posters that illustrated aspects of TRANSIMS and its modules. Compact disks containing a test and evaluation version of TRANSIMS-LANL and its documentation were provided to those attendees who signed the appropriate license agreement.

The TRANSIMS request for proposals (RFP) was posted on August 13, 1999 on the Los Alamos National Laboratory procurement website: http://bus.lanl.gov/bus5/vendor/solicitations/Transims/default.htm. The RFP seeks offerors to:

1. Transform the TRANSIMS technologies into commercially viable software products and/or other Information Technology (IT) services that are available and useful to the transportation planning market. The resultant products and/or IT services shall be designated “TRANSIMS-DOT.”

2. Deliver the TRANSIMS-DOT products and services to up to six early deployment transportation planning organizations in support of their TRANSIMS transition process and plans.

3. Be prepared to conduct all or selected elements of the TRANSIMS-DOT transition process for those early deployment transportation planning organizations that request such assistance.

4. Establish a commercially viable “TRANSIMS” business infrastructure to facilitate the long-term application of the TRANSIMS technologies by the transportation planning market. This support is considered critical to the ultimate success of the TRANSIMS Commercialization Process.

On September 9, 1999, Los Alamos National Laboratory held a Pre-Proposal Meeting as a convenience for prospective offerors to ask questions and for the Laboratory to clarify its needs.

The proposal due date is November 19, 1999. Additional information may be found on the TRANSIMS website:

http://transims.tsasa.lanl.gov.

FURTHER INFORMATION

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